You will need Evernote today. Tag=angles

6-1 Angle Measures

What You'll Learn

To write and solve equations to find unknown angle measures

New Vocabulary angle, acute angle, right angle, obtuse angle, straight angle, complemetary, supplementary, adjacent angles, vertical angles, congruent angles

CONTENT STANDARDS

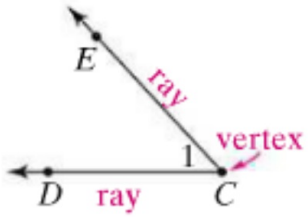
7.G.5

Why Learn This?

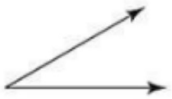
Architects think about angles in the structures they design. The design of a geodesic dome requires triangles. They make the dome stable.

There are several terms that are highlighted in yellow in this lesson. Everything that is highlighted in yellow needs to be entered into your Evernote notes

An **angle** ($\angle$) is a figure formed by two rays with a common endpoint. You can call the angle below left $\angle DCE$, $\angle ECD$, $\angle C$, or $\angle 1$.



You can classify angles by their measures.



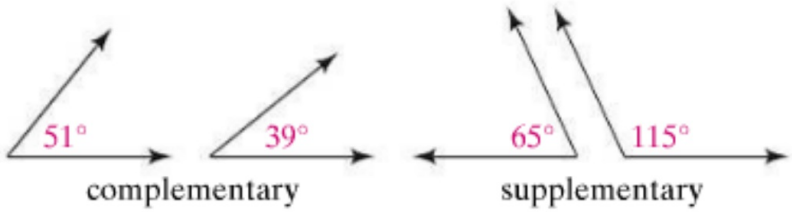
acute angle
between 0° and 90°

right angle
90°

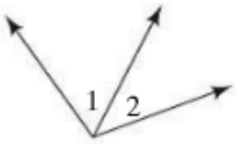
obtuse angle
between 90° and 180°

straight angle
180°

If the sum of the measures of two angles is 90°, the angles are **complementary.** If the sum of the measures is 180°, the angles are **supplementary.**



complementary supplementary



Adjacent angles share a vertex and a side but have no interior points in common. Angles 1 and 2 are adjacent angles.

Vocabulary Tip

The ¬ symbol indicates a right angle. Write "the measure of ∠C" as $m\angle C$.

EXAMPLES Finding Supplements and Complements

1 **Algebra** Settling of the ground causes Italy's Leaning Tower of Pisa to tilt. The diagram on p. 216 describes the angles the tower makes with the ground. Find the measures of these angles.

Step 1 Write an equation.

The two angles are adjacent supplementary angles. You can write an equation by setting the sum of their degree measures equal to 180:

$$(3x - 35) + 2x = 180.$$

Step 2 Solve for x.

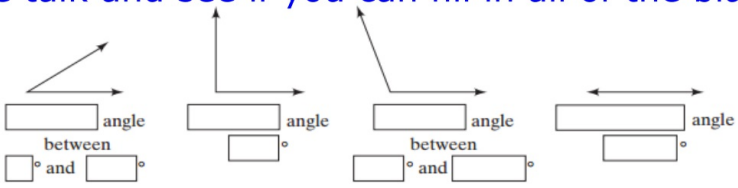
$$\begin{aligned}
(3x - 35) + 2x &= 180 && \leftarrow \text{The angles are supplementary.}\\
2x + (3x - 35) &= 180 && \leftarrow \text{Use the Commutative Property.}\\
(2x + 3x) - 35 &= 180 && \leftarrow \text{Use the Associative Property.}\\
5x - 35 &= 180 && \leftarrow \text{Combine like terms.}\\
5x - 35 + 35 &= 180 + 35 && \leftarrow \text{Add 35 to each side.}\\
5x &= 215 && \leftarrow \text{Simplify.}\\
\frac{5x}{5} &= \frac{215}{5} && \leftarrow \text{Divide.}\\
x &= 43 && \leftarrow \text{Simplify.}
\end{aligned}$$

Step 3 Calculate the angle measures.

$$3(43) - 35 = 94 \quad \text{and} \quad 2(43) = 86$$

The angle measures are 94° and 86°.

Table talk and see if you can fill in all of the blanks



Adjacent angles are _____

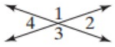
_____

Vertical angles are _____

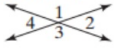
_____

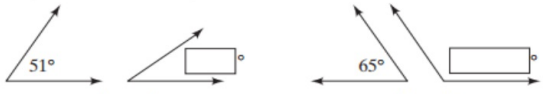
If the sum of the measure of two angles is 90°, the angles are _____. If the sum is 180°, the angles are _____.

Circle an angle adjacent to ∠1.



Circle an vertical angle to ∠1.





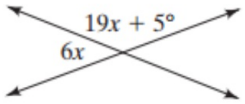
complementary supplementary

Congruent angles are _____

_____

Examples

1 **Finding Supplements and Complements** Write and solve an equation to find the measures of the two angles described at the right.



$6x + (19x + 5) = 180$ ← The angles are supplementary.

$(6x + \square) + 5 = 180$ ← Use the ☐ Property.

$\square + 5 = 180$ ← Combine like terms.

$\square + 5 - \square = 180 - \square$ ← Subtract ☐ from each side.

$\square = \square$ ← Simplify.

$\frac{\square}{\square} = \frac{175}{\square}$ ← Divide.

$x = 7$ ← Simplify.

Calculate the angle measures.

$6(\square) = \square$ and $19(\square) + 5 = \square$

The angle measures are ☐° and ☐°.

2 **Multiple Choice** If $\angle A$ and $\angle B$ are complementary, and $m\angle A$ is five times $m\angle B$, what is $m\angle B$?

(A) 15° (B) 18° (C) 30° (D) 36°

Write and solve an equation. Let $x = m\angle B$ and $m\angle A = 5(m\angle B)$, or $5x$.

$m\angle A + m\angle B = 90$

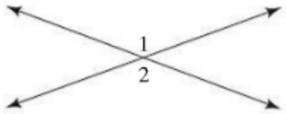
$5x + x = 90$ ← The angles are complementary.

$6x = 90$ ← Combine like terms.

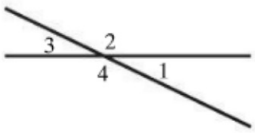
$\frac{6x}{6} = \frac{90}{6}$ ← Divide.

$x = 15$ ← Simplify.

The measure of $\angle B$ is 15°. The correct answer is choice A.



Angles 1 and 2 at the left are vertical angles. **Vertical angles** are formed by two intersecting lines and are opposite each other. Vertical angles have equal measures. Angles with equal measures are **congruent angles.**



EXAMPLE Finding Angle Measures

3 **Runway Design** In the diagram of the runway layout for the Charles B. Wheeler Downtown Airport in Kansas City, Missouri, $m\angle 1 = 25.7°$. Find the measures of $\angle 2$, $\angle 3$, and $\angle 4$.

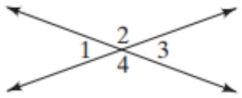
$m\angle 4 = 180° - 25.7°$ ← ∠1 and ∠4 are supplementary.

$= 154.3°$

$m\angle 3 = 25.7°$ ← ∠1 and ∠3 are vertical angles.

$m\angle 2 = 154.3°$ ← ∠2 and ∠4 are vertical angles.

❷ Finding Angle Measures In the diagram, $m\angle 3 = 32°$. Find the measures of $\angle 1$, $\angle 2$, and $\angle 4$.



$m\angle 2 + 32° =$ ☐ ← ∠2 and ∠3 are ☐.

$m\angle 2 + 32° - 32° =$ ☐ $- 32°$ ← Subtract 32° from each side.

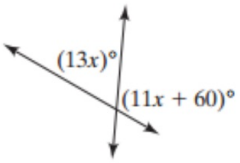
$m\angle 2 =$ ☐ ← Simplify.

$m\angle 1 =$ ☐ ← ∠1 and ∠3 are ☐ angles.

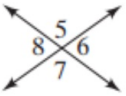
$m\angle 4 =$ ☐ ← ∠2 and ∠4 are ☐ angles.

Quick Check

1. Write and solve an equation to find the measures of the two angles described at the right. ☐



2. In the diagram at the right, $m\angle 8 = 72°$. Find the measures of $\angle 5$, $\angle 6$, and $\angle 7$.

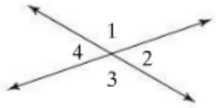


☐

Check Your Understanding

1. **Vocabulary** How are vertical angles and adjacent angles different?

2. **Reasoning** What is the sum of the measures of the four angles formed by intersecting lines?



Classify each angle as *acute, right, obtuse,* or *straight.* Then find the measures of the complement and the supplement of each angle.

3. $m\angle A = 45°$

4. $m\angle B = 105°$

5. $m\angle C = 75°$

No written assignment today.
Instead, we will work through the following worksheet together.

Name _____ Class _____ Date _____

Practice 6-1 — Angle Measures

Solve.

1. If $m\angle A = 23°$, what is the measure of its complement?

2. If $m\angle T = 163°$, what is the measure of its supplement?

3. If a 76° angle is complementary to $\angle Q$, what is the measure of $\angle Q$?

Find the measures of the complement and supplement of each angle.

4. $m\angle A = 41°$

5. $m\angle C = 38.1°$

6. $m\angle S = 87.3°$

7. $m\angle F = 19°$

8. $m\angle R = 76°$

9. $m\angle B = 24.9°$

10. $m\angle N = 62°$

11. In the diagram, $m\angle 1$ is 46°. Find the measures of $\angle 2$, $\angle 3$, and $\angle 4$.